DOCUMENT RESUME

ED 022 933 08 VT 006 888

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OCCUPATIONAL MATHEMATICS; ADDITION OF FRACTIONS. REPORT NO. 16-E. FINAL REPORT.

Washington State Coordinating Council for Occupational Education, Olympia.; Washington State Univ., Pullman. Dept. of Education.
Spons Agency-Office of Education (DHEW), Washington, D.C.
Bureau No-BR-7-0031
Pub Date Jun 68
Grant-OEG-4-7-070031-1626
Note-94p.
EDRS Price MF-$0.50 HC-$3.84
Descriptors-*ADDITION, *ARITHMETIC, *FRACTIONS, *PROGRAMED TEXTS, *VOCATIONAL EDUCATION

This programed mathematics textbook (Volume I) is for student use in vocational education courses. It was developed as part of a programed series covering 21 mathematical competencies which were identified by university researchers through task analysis of several occupational clusters. The development of a sequential content structure was also based on these mathematics competencies. After completion of this program the student should be able to: (1) know that "sum" indicates the operation of addition, (2) add two or three numeric fractions of the form a/b where 0 is less than a/b and when a/b is less than 100, (3) add two or three fractions of the form k/y, where 0 is less than k when k is less than 100 and y is the same literal denominator for all fractions, (4) add two or three literal fractions with the same denominators, and (5) add mixed fractions of the form Xa/b, where 0 is less than (X,a, and b) and these are less than 100. The material is to be used by individual students under teacher supervision. Twenty-six other programed texts and an introductory volume are available as VT 006 882-VT 006 909, and VT 006 975. (EM)

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Report No. 16-E

Occupational Mathematics

ADDITION OF FRACTIONS

June 1968

U.S. DEPARTMENT OF
HEALTH, EDUCATION AND WELFARE

Office of Education
Bureau of Research

VT006888

ED022933

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
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Occupational Mathematics

ADDITION OF FRACTIONS

Project No. 0E7-0031
Contract No. OEG-4-7-070031-1626
Report No. 16-E

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June 1968

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Washington State University, Department of Education, Pullman, Washington
State Coordinating Council for Occupational Education, Olympia, Washington

OBJECTIVES

1. The student should know that the word "sum" indicates the operation of addition.

2. The student should be able to add two or three numeric fractions of the form a/b where $0 < (a,b) < 100$.

3. The student should be able to add two or three fractions of the form k/y, where $0 < k < 100$, and y is the same literal denominator for all fractions.

4. The student should be able to add two or three literal fractions with the same denominators.

5. The student should be able to add mixed numbers of the form $X\ \frac{a}{b}$, where $0 < (x, a, \& b) < 100$.

Greetings! You are about to begin improving your knowledge of basic mathematics. There are many important uses for the mathematics you are learning.

This booklet is not like your ordinary books. It is designed to help you learn as an individual. On the following pages you will find some information about mathematics. After the information is presented, you will be asked a question. Your answers to these questions will determine how you proceed through this booklet. When you have selected your answer to the question, turn to the page you are told to.

Do not write in this booklet. You may wish to have a pencil and some paper handy so you can write when you want to.

Remember this is not an ordinary book.

1. Study the material on the page.
2. Read the question on the page (you may want to restudy the material on the page).
3. Select the answer you believe is correct.
4. Turn to the page indicated by your answer.

Are you ready to begin?

(a) Yes — Turn to page 1

(b) No — Turn to page C

(c) HELP — Go see your teacher

Your answer was (b) No.

Well, this booklet is a little different.

Go back and read page B again. After you have read it, you will probably be ready to begin.

It is important and useful to be able to add fractions. The need to add fractions arises in many everyday situations.

In order to add fractions, their denominators must be the same. If the denominators of the fractions are the same, you simply add the numerators.

If the denominators of the fractions are not the same, you must find a common denominator. After a common denominator has been found, the numerators are simply added as before. The denominator of the total is the same as the common denominator.

Go on to page 2.

Here are some examples:

2/5 + 2/5 = 4/5 1/9 + 4/9 = 5/9	In both of these examples the denominators were already equal. So, the numerators were simply added together.
1/2 + 2/3 = 3/6 + 4/6 = 7/6 1/3 + 2/9 = 3/9 + 2/9 = 5/9	In both of these examples the denominators were not equal. A common denominator was found, and the numerators added together.

What is the sum of 2 and 3?

(a) 6 Turn to page 6

(b) 5 Turn to page 8

(c) 1 Turn to page 10

The correct answer was 3/5.

Did you notice that the question asked for the sum of two fractions? This means you add them.

The problem is really: 1/5 + 2/5 = ?

Let's see how to do this.

First see if the denominators of both fractions are the same. In this problem they are both 5. We call 5 the common denominator. We can say that fifths are being added.

You know that if you add oranges to oranges you always get oranges.

Go on to page 20.

Your answer of 3/5 is correct. You've got the right idea!

When the denominators are the same, simply add the numerators.

Here's another one.

What is 4/7 + 2/7 = ?

(a) 6/7 Turn to page 12

(b) 6/14 Turn to page 9

(c) 2/7 Turn to page 5

No! The correct answer was 6/7.

$$4/7 + 2/7 = 6/7$$

Remember not to add denominators. Keep the same denominator and add the numerators.

Find 2/9 + 2/9.

(a) 4/18 Turn to page 19

(b) 4/9 Turn to page 16

(c) 5/9 Turn to page 11

No! The sum of 2 and 3 is 5. The word sum (pronounced some) always means to add.

For example: The sum of 2 and 4 is 6. This means the same thing as 2 + 4 = 6.

Remember that + is the symbol used for addition.

What is the sum of 1/5 and 2/5?

(a)	3/5	Turn to page 4
(b)	3/10	Turn to page 3
(c)	I'm not sure what to do	Turn to page 7

The correct answer was 3/5.

Did you notice that the question asked for the sum of two fractions? This means you add them.

The problem is really: 1/5 + 2/5 = ?

Let's see how to do this.

First see if the denominators of both fractions are the same. In this problem they are both 5. We call 5 the common denominator. We can say that fifths are being added.

You know that if you add oranges to oranges you get oranges.

Go on to page 20.

Your last answer was 5. Very good! You recognized that sum meant to add.

Find the sum of 1/5 and 2/5.

(a)	3/10	Turn to page 3
(b)	I'm not sure what to do	Turn to page 7
(c)	3/5	Turn to page 4

No! The correct answer was 6/7.

$$4/7 + 2/7 = 6/7$$

Remember not to add denominators. Keep the same denominator and add the numerators.

Find 2/9 + 2/9.

(a) 4/18 Turn to page 19

(b) 4/9 Turn to page 16

(c) 5/9 Turn to page 11

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Remember that + is the symbol used for addition.

What is the sum of 1/5 and 2/5?

(a)	3/5	Turn to page 4
(b)	3/10	Turn to page 3
(c)	I'm not sure what to do	Turn to page 7

No! You don't understand the idea.

Go ask your teacher for help and then return to page 1.

Correct! You are doing very well.

Let's do another problem.

Add 1/8 and 3/8.

(a) 1/2 Turn to page 17

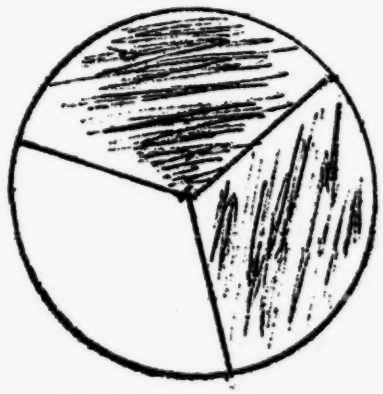
(b) 4/8 Turn to page 22

(c) 4/16 Turn to page 24

O.K! Let's try again. The problem was to add 1/3 and 1/3.

Both fractions have 3 as a denominator. So, we simply add the numerators and keep the 3 in the denominator of the answer.

So, 1/3 + 1/3 = 2/3



In the circle you can see that each section is 1/3. By adding 1/3 and 1/3, you end up with 2/3 of the circle.

What is the sum of 2/7 and 3/7?

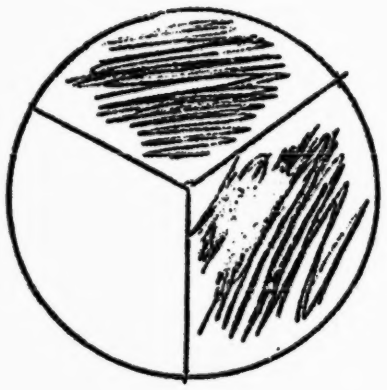
(a) 5/7 Turn to page 25

(b) 5/14 Turn to page 11

O.K! Let's try again. The problem was to add 1/3 and 1/3.

Both fractions have 3 as a denominator. So, we simply add the numerators and keep the 3 in the denominator of the answer.

So, 1/3 + 1/3 = 2/3



In the circle you can see that each section is 1/3. By adding 1/3 and 1/3 you end up with 2/3 of the circle.

What is the sum of 2/7 and 3/7?

(a) 5/7 Turn to page 25

(b) 5/14 Turn to page 11

Good, 2/3 is correct! You kept the three as denominator and added the ones.

Try this one.

What is 4/7 + 2/7?

(a) 6/7 Turn to page 12

(b) 6/14 Turn to page 9

(c) 2/7 Turn to page 5

Right! 4/9 is the answer.

You are getting it now.

What is 1/4 + 2/4?

(a) 3/2 Turn to page 11

(b) 3/4 Turn to page 30

(c) 3/8 Turn to page 23

Very good! You noticed that your answer should be reduced. Always reduce your answers.

Remember that a reduced fraction has no common factors in its numerator and denominator.

Find 6/15 + 7/15.

(a) 13/30 Turn to page 28

(b) 13/15 Turn to page 29

(c) 25/30 Turn to page 27

In order to proceed with addition of fractions, you must be able to reduce fractions to lowest terms.

Go take Unit 3 on Equivalent Fractions and then return to page 12 of this Unit.

No! Your answer was not correct.

The right answer was 2/9 + 2/9 = 4/9.

Remember that 9 is the common denominator and that we are talking about <u>ninths</u>.

2	ninths	
+ 2	ninths	Notice that we are just adding numerators.
4	ninths	

What is the sum of 2/7 and 3/7?

(a) 5/7 Turn to page 25

(b) 5/14 Turn to page 23

(c) 6/49 Turn to page 11

The same is true with fractions. If you add fifths to fifths, you get fifths.

Let's look at this problem another way.

$$\begin{array}{rl} 1 & \text{fifth} \\ +\ 2 & \text{fifths} \\ \hline 3 & \text{fifths} \end{array}$$

This is really the same as our problem.

$$1/5 + 2/5 = 3/5$$

We said 5 is the common denominator. So, you simply add the numerators, leaving the common denominator as the denominator of the answer.

Here's one more for you to work.

What is 1/3 + 1/3?

(a) I still don't see it Turn to page 14

(b) 2/3 Turn to page 15

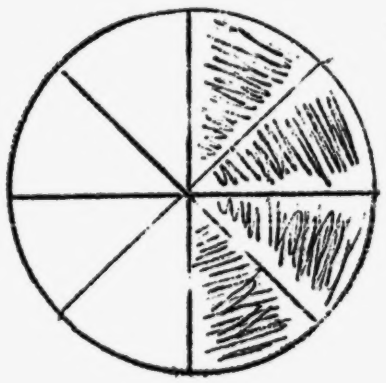
(c) 2/6 Turn to page 13

In order to proceed with addition of fractions, you must be able to reduce fractions to lowest terms.

Go take Unit 3 on Equivalent Fractions and then return to page 12 of this Unit.

Yes! 4/8 does express the sum of 1/8 and 3/8. But 4/8 can be reduced.

Let's see what this means.



You can see that the circle is divided into eights. In the shaded part there is 4/8 of the circle. But, from the circle you can see that 4/8 of the circle is the same as 1/2 of it.

So, we say 4/8 = 1/2.

ALWAYS REDUCE YOUR ANSWERS!

Reduce the fraction 3/9 to lowest terms.

(a) 1/3 — Turn to page 26

(b) 1/4 — Turn to page 18

(c) I don't know how to do it — Turn to page 21

Oops! You just about had it.

Let's try again.

Remember to add <u>numerators</u>. Do not add the denominators.

What is 3/7 + 2/7?

(a) 5/7 Turn to page 25

(b) 5/14 Turn to page 11

(c) 6/49 Turn to page 11

No! You must <u>not</u> add the denominators when adding fractions.

Look at this problem.

1/8 + 3/8 = 4/8 = 1/2

Add numerators 1 + 3 to get 4. Keep the 8 for the denominator and then reduce your answer.

What is 3/10 + 3/10?

(a) 6/10 Turn to page 42

(b) 3/5 Turn to page 38

(c) 6/20 Turn to page 32

Yes! 5/7 is the right answer.

Let's do another one.

Find the sum of 1/4 + 2/4.

(a) 3/2 Turn to page 11

(b) 3/4 Turn to page 30

(c) 3/8 Turn to page 11

Very good! 1/3 is correct.

Dividing both numerator and denominator of a fraction by the same quantity does not change its value.

From now on always reduce your answers.

Find 6/15 + 7/15.

(a) 13/30 Turn to page 28

(b) 13/15 Turn to page 29

(c) 25/30 Turn to page 27

No! The correct answer was 13/15.

6/15 + 7/15 = 13/15

Don't let the larger numbers fool you. They are no different than the smaller ones.

15 is the common denominator. If you add 6 of them to 7 of them you have 13. Right?

O.K. Let's try again.

3/21 + 8/21 = ?

(a) 1/2 Turn to page 41

(b) 11/21 Turn to page 33

(c) 11/42 Turn to page 36

No! The correct answer was 13/15.

6/15 + 7/15 = 13/15

Don't let the larger numbers fool you. They are no different than the smaller ones.

15 is the common denominator. If you add 6 of them to 7 of them, you have 13. Right?

O.K. Let's try again.

3/21 + 8/21 = ?

(a) 1/2 Turn to page 41

(b) 11/21 Turn to page 33

(c) 11/42 Turn to page 36

You are doing very well! Let's continue by working addition problems where you must find a common denominator.

Do this problem.

What is 3/4 + 7/8?

(a) 5/6 Turn to page 51

(b) $1\frac{5}{8}$ Turn to page 40

(c) 13/8 Turn to page 35

Good! 3/4 is correct.

Add 1/8 and 3/8. Your answer is:

(a) 1/2 Turn to page 17

(b) 4/8 Turn to page 22

(c) 4/16 Turn to page 24

Fine. 11/15 is correct.

Let's go on.

What is 3/4 + 7/8 ?

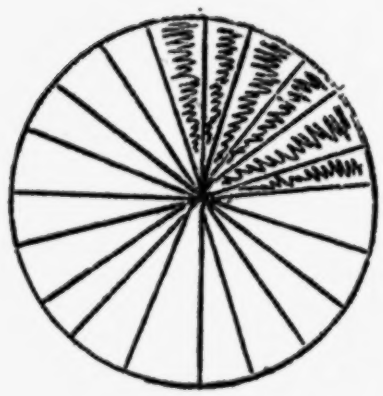
(a) 5/6 Turn to page 51

(b) 10/12 Turn to page 51

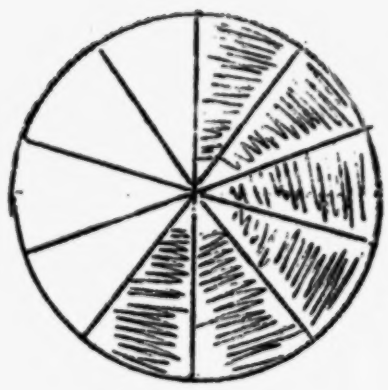
(c) $1\frac{5}{8}$ Turn to page 40

(d) 13/8 Turn to page 35

You did it wrong again. Come on now. Concentrate.



In the circle on the left 6/20 of it is shaded.



In this circle 6/10 is shaded. Do the shaded areas look equal? Of course not. 6/10 is not equal to 6/20.

When you have 3/10 and add 3/10 more you must get 6/10.

$$\begin{array}{r} 3 \text{ tenths} \\ +\ 3 \text{ tenths} \\ \hline 6 \text{ tenths} \end{array}$$

This is just simple addition. Keep the tenths as your denominator. Add the numerator.

(Continue on next page)

Now, try one more.

What is 1/6 + 2/6 ?

(a) 1/2 Turn to page 76

(b) 3/12 Turn to page 46

Right! 3/21 + 8/21 = 11/21.

Let's try one more.

Find the sum of 7/15 and 4/15.

(a) 28/15 Turn to page 34

(b) 11/30 Turn to page 24

(c) 11/15 Turn to page 31

No! The correct answer is:

7/15 + 4/15 = 11/15

Try this problem.

What is 1/4 + 1/4 ?

(a) 1/2 Turn to page 37

(b) 2/3 Turn to page 39

(c) 2/8 Turn to page 24

Yes! 3/4 + 7/8 = 13/8.

Does 3/4 + 7/8 also equal $1\frac{5}{8}$?

(a) Yes Turn to page 50

(b) No Turn to page 73

No! The correct sum of 3/21 and 8/21 is 11/21.
I thought you had it for a minute.

Let's review the method again.

When the denominators of the fractions to be added are the same, USE THAT DENOMINATOR IN THE ANSWER. To find the new numerator just add up the individual numerators.

Add 5/26 and 2/26.

(a) 10/26 Turn to page 39

(b) 7/26 Turn to page 37

(c) 3/26 Turn to page 39

Yes! 7/26 is correct. Very good! I think you have it.

Here is one more.

What is 2/15 + 9/15 ?

(a) 11/15 Turn to page 31

(b) 11/30 Turn to page 39

Excellent! 3/5 is correct. You remembered to reduce your answer.

What is 6/15 + 7/15 ?

(a) 13/30 Turn to page 27

(b) 13/15 Turn to page 29

(c) 25/30 Turn to page 28

No! That's not quite it.

You need some additional help.

Go ask your teacher to clear up this area for you and then return to page 12.

$1\frac{5}{8}$ is correct.

Does 3/4 + 7/8 also equal 13/8 ?

(a) Yes Turn to page 50

(b) No Turn to page 73

No! The correct sum of 3/21 and 8/21 is 11/21.
I thought you had it for a minute.

Let's review the method again.

When the denominators of the fractions to be added are the same, USE THAT DENOMINATOR IN THE ANSWER. To find the new numerator just add up the individual numerators.

Add 5/26 and 2/26.

(a) 10/26 Turn to page 39

(b) 7/26 Turn to page 37

(c) 3/26 Turn to page 39

Yes! 6/10 is the correct sum of 3/10 and 3/10.

But, 6/10 can be reduced.

If we divide both numerator and denominator by 2, we get:

$6/2 = 3$ and $10/2 = 5$

Therefore, $6/10 = 3/5$

Remember, it is O.K. to divide both numerator and denominator by the same number. It will not change the value of the fraction.

Reduce 6/18 to lowest terms.

(a) 3/5 Turn to page 21

(b) 1/3 Turn to page 26

(c) I'm not sure how to do it Turn to page 18

Your answer was incorrect!

You noticed that 9 was a common denominator. But, you can't just change the 3 to a 9 and not change the numerator too.

Whenever a denominator is changed, the numerator must also be changed to keep the value of the fraction the same.

Turn to page 49.

Fine! You said you know about equivalent fractions.

Let's do another problem where you need to use that idea.

What is 1/2 + 1/8 ?

(a) 5/8 Turn to page 60

(b) 2/8 Turn to page 53

(c) 1/5 Turn to page 45

Incorrect!

Reread the explanation and examples on page 2 and then go back to page 44 and make another selection.

No! Wrong again. 1/6 + 2/6 = 3/6 = 1/2.

Go ask your teacher to help you. Then return to page 12 of this Unit.

You said you don't know what equivalent fractions are.

Go and work Unit 3. It will help you to understand them.

Then return to page 29 of this Unit.

Good! 5/9 is correct. I think you understand it now.

Add 5/12 and 2/3.

(a) $1\ \frac{1}{12}$ Turn to page 56

(b) 13/12 Turn to page 58

(c) 7/15 Turn to page 55

Now let's see how to correctly add 1/3 and 2/9.

Notice that $3 \cdot 3 = 9$. So, 9 would be a good common denominator.

$$1/3 = 1/3 \cdot 3/3 = 3/9$$

So, $1/3 + 2/9 = 3/9 + 2/9 = 5/9$.

Remember, any fraction where the numerator and denominator are the same is equal to one. To find a common denominator, you must make use of equivalent fractions.

Do you know what equivalent fractions are?

(a) Yes Turn to page 44

(b) No Turn to page 47

Excellent! You said that 13/8 = $1\frac{5}{8}$.

Both of these are the same. It is correct to leave the answer as 13/8. Often this is easier to work with than $1\frac{5}{8}$ would be.

Add the fractions 3/k + 5/k.

(a) 8/k — Turn to page 63

(b) 8/2k — Turn to page 75

(c) I don't understand what to do — Turn to page 74

Your last answer was incorrect. The correct sum of 3/4 and 7/8 is 13/8.

Let's see why.

You recall that the denominators of both fractions must be the same before the fractions can be added. In our problem the denominators are 4 and 8.

Can you see any simple relationship between 4 and 8? Sure you can: $8 = 4 \times 2$.

So, let's use 8 as a common denominator. To do that we must change the fraction 3/4 into eights.

3/4 = how many eights?

To get 8 in the denominator we must multiply by 2.

However, you must not change the value of the fraction, so the numerator must be multiplied by 2 as well.

$3/4 \cdot 2/2 = 6/8$

Since 6/8 is equivalent to 3/4, the value of 3/4 remained unchanged.

Turn to page 52.

Now back to our addition.

We can say that: 3/4 + 7/8 = 6/8 + 7/8 = 13/8

Once both fractions have 8 as denominators, they are simply added as before.

Let's try another one.

Add 1/3 and 2/9.

(a) 3/12 Turn to page 59

(b) 3/9 Turn to page 43

(c) 5/9 Turn to page 48

No! You don't quite have it.

Maybe your teacher can help clear up the problem.

Then return to page 29 of the Unit.

Right! 6/7 + 5/14 = 17/14.

Can you do one using letters? Try one.

Add the fractions: 3/k + 5/k.

(a)	8/k	Turn to page 63
(b)	8/2k	Turn to page 75
(c)	I don't understand what to do	Turn to page 74

No! You added incorrectly.

REMEMBER: Never add denominators! You must find a common denominator.

Here 12 could be a common denominator.

$$2/3 = 2/3 \cdot 4/4 = 8/12$$

So, $5/12 + 2/3 = 5/12 + 8/12 = 13/12$

Try this problem.

Find the sum of $2/5 + 2/15$.

(a) 4/15 Turn to page 53

(b) 3/5 Turn to page 53

(c) 8/15 Turn to page 61

Yes! $1\ \frac{1}{12}$ is the sum of 5/12 and 2/3.

Is the answer 13/12 also correct?

(a) Yes Turn to page 68

(b) No Turn to page 62

That answer is incorrect. Here is the reason why.

2 is equivalent to 6/3. Therefore, $2\frac{2}{3}$ is equal to 6/3 + 2/3 or 8/3.

Do you know what equivalent fractions are?

(a) Yes Turn to page 44

(b) No Turn to page 47

Yes! 13/12 is the sum of 5/12 and 2/3.

Is the answer $1\frac{1}{12}$ also correct?

(a) Yes Turn to page 68

(b) No Turn to page 62

No! That is not correct.

Remember the problem? It was to add 1/3 and 2/9.
You must first find a common denominator.

It is <u>never</u> correct to add the denominators of the fractions.

Turn to page 49.

Excellent! 5/8 is correct.

Here's another one.

Find the sum of 5/12 and 2/3.

(a) $1\frac{1}{12}$ Turn to page 56

(b) 13/12 Turn to page 58

(c) 7/15 Turn to page 55

Fine! 2/5 and 2/15 do equal 8/15.

What is the sum of 6/7 and 5/14 ?

(a) $1\frac{1}{14}$ Turn to page 53

(b) 17/14 Turn to page 54

(c) 11/21 Turn to page 53

Incorrect!

Let's think about what $1\ \frac{1}{12}$ really is. I'm sure you know that there are 12/12 in 1. So, $1\ \frac{1}{12}$ is simply 12/12 + 1/12 which equals 13/12.

Try another one.

$2\ \frac{2}{3}$ is equal to which fraction below ?

(a) 4/6 Turn to page 53

(b) 4/3 Turn to page 57

(c) 8/3 Turn to page 67

Very good!

Here is another one.

What is x/z + y/z ?

(a) I don't understand this one Turn to page 72

(b) (x + y)/2z Turn to page 69

(c) (x + y)/z Turn to page 70

Your answer was incorrect!

You noticed that 15 was a common denominator. However, when a denominator is changed, the numerator must also be changed to keep the value of the fraction the same.

Turn to page 49.

Good! Maybe you've got it this time.

What is x/z + y/z?

(a)	I don't understand this one	Turn to page 69
(b)	(x + y)/2z	Turn to page 72
(c)	(x + y)/z	Turn to page 70

O.K. Let's see how to add 1/2 and 1/4.

First we need to find a common denominator for 2 and 4.

Is there a simple relationship between 2 and 4?

Yes! $4 = 2 \cdot 2$. So, we can take 4 as a common denominator. This means we need to change 1/2 into an equivalent fraction with 4 as a denominator.

So, $1/2 \cdot 2/2 = 2/4$

Now we can easily add 2/4 + 1/4 and get 3/4. Always look for the relationship between the denominators.

Go to page 77.

Good! You are doing okay now.

Let's try adding two more fractions.

Find the sum of 2/5 and 2/15.

(a) 3/5 Turn to page 53

(b) 8/15 Turn to page 61

(c) 4/15 Turn to page 64

Very good!

You correctly noticed that the quantities $1\frac{1}{12}$ and 13/12 were the same.

Now, try addition of fractions that contain a letter.

Add: $3/k + 5/k = ?$

(a) $8/k$ Turn to page 63

(b) $8/2k$ Turn to page 75

(c) I don't understand what to do Turn to page 74

Remember that you follow the same rules whenever you add literal fractions. (Ones that have letters instead of numbers.) In other words, the denominators must be the same and then you add the numerators.

For example, $a/b + c/b = (a + c)/b$

Or, $3y/4x + 6z/4x = (3y + 6z)/4x$

What is the sum of $4b/c$ and k/c ?

(a) $4bk/c$ Turn to page 78

(b) $(4b + k)/c$ Turn to page 63

Excellent!

Remember that you can add fractions that use letters the same as fractions with numbers. As long as their denominators are the same, the numerators are just added.

Add 1/2 and 1/4.

(a) I don't know what to do — Turn to page 66

(b) 6/8 — Turn to page 71

(c) 3/4 — Turn to page 85

Yes! 1/2 + 1/4 = 6/8. But is there a simpler way to write 6/8?

You should notice that 6/8 is not in lowest terms.

$6 = 3 \cdot 2$ and $8 = 4 \cdot 2$

So, $6/8 = \frac{3 \cdot 2}{4 \cdot 2}$

But, $\frac{3 \cdot 2}{4 \cdot 2} = 3/4 \cdot 2/2 = 3/4 \cdot 1 = 3/4$

Remember that your final answer should always be reduced. This means that the numerator and denominator should have no common factors.

Turn to page 86.

Remember that you follow the same rules whenever you add literal fractions. (Ones that have letters instead of numbers.) In other words, the denominators must be the same and then you add numerators.

For example, $a/b + c/b = (a + c)/b$

Or, $3y/4x + 6z/4x = (3y + 6z)/4x$

What is the sum of $4b/c$ and k/c?

(a) $4bk/c$ Turn to page 78

(b) $(4b + k)/c$ Turn to page 63

Your answer was incorrect!

Let's think about what $1\frac{5}{8}$ really is. You know that there are 8/8 in 1. So, $1\frac{5}{8}$ is simply 8/8 + 5/8 = 13/8.

Let's try another problem to see if you understand this idea.

Add 5/12 and 2/3.

(a) $1\frac{1}{12}$ Turn to page 56

(b) 13/12 Turn to page 58

(c) 7/15 Turn to page 55

Being able to work with letters is very important.

Go to Unit 2. After working that Unit return to page 1 of this Unit.

No!

Working with letters is the same as working with numbers. You still should not add the denominators.

k is a common denominator.
So, we simply add the numerators 3 and 5.
Therefore, 3/k + 5/k = 8/k.

Let's try another one.

What is 5/x + 9/x ?

(a) 14/x Turn to page 65

(b) 14/2x Turn to page 89

(c) I don't get it Turn to page 78

Good! You are correct. Maybe you've got it now.

Here's one more just to be sure.

Find the sum of 7/15 and 4/15.

(a) 28/15 Turn to page 39

(b) 11/30 Turn to page 24

(c) 11/15 Turn to page 31

Here's another example.

What is 2/9 + 1/3?

Is there a simple relationship between 3 and 9?

Yes! 9 = 3 x 3. So, we should multiply the fraction 1/3 by 3/3 to change it to ninths.

So, $1/3 = 1/3 \cdot 1 = 1/3 \cdot 3/3 = 3/9$.

Then, 2/9 + 1/3 = 2/9 + 3/9 = 5/9.

That's all there is to it.

Here's one for you.

What is 1/5 + 3/10 ?

(a) 4/10 Turn to page 79

(b) 5/10 Turn to page 82

(c) 1/2 Turn to page 81

You are having difficulty working with letters.

Go to Unit 2. After working that Unit, return to page 1 of this Unit and continue.

No! The correct answer was 1/2. Let's see how to do it.

The problem was to add 1/5 and 3/10. First, we need a common denominator to add the fractions, since 5 and 10 are not the same.

One way to find a common denominator is to notice whether any simple relationship exists between the denominators. Here, $10 = 2 \cdot 5$. So, we can take 10 as a common denominator.

Changing 1/5 into an equivalent fraction we have:

$$1/5 = 1/5 \cdot 1 = 1/5 \cdot 2/2 = 2/10.$$

Now, the fractions can be added.

$$1/5 + 3/10 = 2/10 + 3/10 = 5/10$$

But 5/10 can be reduced to 1/2. Or, you can say we cancelled 5 out of both the numerator and denominator.

The answer, then, is $1/5 + 3/10 = 1/2$.

Turn to page 80.

Remember to leave your answer in lowest terms. This means that the numerator and denominator should have no common factors.

Now try one more.

What is 2/7 + 5/14 ?

(a) 7/21 Turn to page 88

(b) 9/14 Turn to page 81

(c) 1/3 Turn to page 53

Good! You're catching on now.

Go back and work the problem on page 70 then continue from there.

Turn to page 70.

Yes! You added 1/5 and 3/10 correctly.

But, is 5/10 in lowest terms? No! Let's see why.

$5/10 = 5/5 \cdot 1/2$. Since $5/5 = 1$, it doesn't have to be there. So, we just reduce 5/10 to 1/2.

Always reduce your answers. This means that the numerator and denominator should have no common factors.

Turn to page 86.

It is necessary that you understand how to reduce fractions.

Go to Unit 3. After working that Unit, return to page 29 of this Unit and continue.

Fine! You reduced 12/36 to 1/3. Correct!

From now on always reduce answers to lowest terms.

Turn to page 81.

Your last answer was correct!

You are doing very well.

Go to Booklet II of this Unit and continue with your work on page 90.

Let's give it another try.

Reduce 12/36 to lowest terms.

(a) 6/18 Turn to page 87

(b) 1/4 Turn to page 83

(c) 1/3 Turn to page 84

It is necessary that you understand how to reduce fractions.

Go to Unit 3. After working that Unit, return to page 29 of this Unit and continue.

No! You fell into the old trap.

You must have a common denominator before you try to add.

Go ask your teacher to help you and then return to page 29 of this Unit.

The correct answer was 14/x.

You need to understand how to use letters in order to proceed.

Go to Unit 2. After working that Unit, return to page 1 of this Unit and continue.